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(54) Cellular position locating system.

(57) The invention comprises a portable locating unit (10) useful both as a cellular telephone and portable global positioning system that provides latitude and longitude information remotely to a base unit display (18). The system includes a small hand held receiver (10) that receives signals from a satellite global positioning system and timing and computing circuits to provide location information signals. The hand held unit also includes a modem and transmitter to a cellular telephone network (16) which is connected to the base unit computational system and display (18). The location of an individual or object can thus be determined at the remote station through the use of the cellular telephone network.

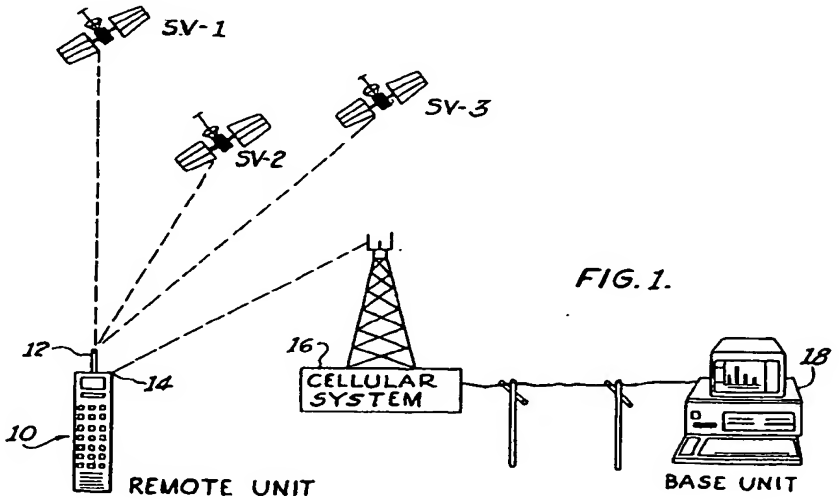

FIG. 1.

EP 0 528 090 A1

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a system for ascertaining the latitude and longitude of an individual or object at a remote location and transmitting information to a base operation using a man-pack or singular portable personnel unit that embodies a cellular telephone network in conjunction with a satellite navigation system, and specifically to a hand-held locating unit that can serve both as a cellular telephone and a portable globular positioning system to provide latitude and longitude information for display at a base unit.

2. Description of the Prior Art

The prior art shows a plethora of systems for locating individual vehicles relative to a central station. U.S. Patent 4,701,760, issued to Raoux on October 20, 1987 shows a vehicle monitoring system that uses World Omega Network and a vehicle carried receiver to provide approximate coordinates to a central location. U.S. Patent 4,897,642, issued to DiLulo et al., January 30, 1990, shows a method for monitoring the status of a multiple part vehicle (such as an eighteen wheel truck) and its cargo carrier through the use of satellites and an earth station.

U.S. Patent 3,568,161, issued to Knickel, March 2, 1971 shows a vehicle locator system which employs a plurality of sensor stations and a central station. U.S. Patent 4,791,572, issued to Green et al., December 13, 1988, shows a locating system that uses the LORAN-C system for positioning information. U.S. Patent 4,891,761, issued to Gray, January 2, 1990, shows a system for updating a digitized map comparing known and unknown intersections in conjunction with a navigational tracking unit.

The units described in the prior art are complex in operation and do not utilize available cellular telephone technology. The present invention overcomes problems of the prior art by providing a non-complex portable hand-held unit that has cross country capability and versatility for use as a regular cellular telephone in conjunction with a precise navigational locating system that can be conveniently and easily carried for transmission and display of position information at a base location.

BRIEF SUMMARY OF THE INVENTION

A global positioning system especially adapted for use by an individual or object that includes a portable remote unit and a base information display unit. The portable remote unit includes an RF receiver circuit for use with a satellite navigation system, a microprocessor for analyzing coded signals, cellular phone modem circuits for transmitting encoded signals to the base unit and a time of day clock. The base unit includes a computational system for decoding position data and a visual display device for presenting the remote unit map coordinates.

The portable remote unit is comprised of four sub-systems which include the global positioning system RF "L" band antenna and receiver that receives signals from a plurality of existing satellites. A microprocessor is used as the computational system that receives the output from a signal demodulator in the GPS receiver. The central timing circuit for accurate time of day has outputs connected to the GPS demodulator and the microprocessor. The GPS receiver generates its own ephemeris data called "Pseudo Random Code" and a code train that matches the satellite code exactly. The Pseudo Random Code is generated at the same time as the satellite codes are received. The received train of pulses from the satellite is, then matched with the Pseudo Random code to provide a time difference between satellite time and the Pseudo Random Code generated time which provides for satellite range. The information is then stored in memory and provided to a cellular telephone modem and transmitter for transmission through the cellular telephone system.

The base unit, which receives and coordinates the locations of various personnel at the remote locations, includes a computation system for decoding the position data transmitted from the remote units through the cellular telephone system. The base unit uses a computer that includes a visual display device showing a map, upon which the decoded position data will be used to show coordinates in latitude and longitude of each remote unit.

The remote unit in one configuration may be a small hand-held unit using battery power that includes a GPS helix antenna for receiving satellite signals and a cellular antenna for transmission of the coded position information to the cellular telephone system. The remote unit could also be configured to use electrical power from a vehicle.

When using the present invention it should be noted that the invention combines an existing global navigational positioning system through the use of satellites, cellular telephone technology, computer and modem interfaces. Thus the hand carried unit is self contained. The remote unit includes a special modem system which could use, in one example, Bell 202A Protocol without the use of a dial tone, in order to transfer position data from computer memory to the cellular phone system. The hand held unit also includes frequency shift

circuitry built within and in one embodiment may use a BAUD rate of 1200 bits per second.

It is an object of this invention to provide a hand held "man pack unit" for use by an individual or object to provide geographical positioning information such as latitude and longitude from a remote site to a base unit using cellular telephone methodology.

It is another object of this invention to provide a relatively small portable hand held unit that can provide geographical positioning information throughout the globe to a base unit having a display of the geographical location on a map.

It is another object of this invention to provide a low cost, readily available global positioning system for use by individuals or objects at remote locations to provide geographical positioning information of the individuals or objects to a base station using existing satellite and cellular telephone technologies.

In accordance with these and other objects which will be apparent hereinafter, the instant invention will now be described with particular reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a basic schematic diagram of the system according to the invention.

Figure 2 shows an additional schematic diagram of the basic invention.

Figure 3 shows a schematic circuit diagram of the remote unit used in the present invention.

Figure 4 shows a block diagram showing the basic circuitry of the remote unit.

Figure 5 shows one possible configuration of a remote unit in a perspective view.

PREFERRED EMBODIMENT OF THE INVENTION

Referring now to Figure 1, the invention is shown which uses signals from satellites SV1, SV2 and SV3 which are transmitted to the remote unit 10 having a first antenna 12 for receiving the signals from the satellites and second antenna 14 for transmitting the appropriate signals to a cellular telephone system 16. The cellular telephone system then provides the proper signals to the base unit whereupon the information is transformed into a display. Figure 2 shows the base unit which includes a computer 18 connected to a visual display 20 which will provide the appropriate latitude and longitude location of the remote unit 10 on the display map.

Overall, the invention is comprised of the remote unit 10, a cellular phone system 16 and the base unit 18. The remote unit 10 includes an RF "L" band receiver for the global positioning system, a computational system comprised of a microprocessor, a cellular telephone and a special telephone modem system. The base unit 18 is comprised of a computational system 18 for decoding position data received from remote units and includes a visual display 20 which presents the remote unit map coordinates on a map display.

Referring now to Figure 3, a remote unit 10 is shown comprised of the helix L band antenna 12 connected to the global positioning system receiver circuits 22 having an output to microprocessor circuits 24. The output of the microprocessor circuits circuits 24 is connected to modem circuits 26 and to the cellular telephone circuits 28 whose output goes to antenna 14 for transmission to a cellular telephone receiver.

Referring now to Figure 4, a more detailed diagram of the remote unit is shown. Antenna 12 receives an L band signal from the re global positioning system and satellite network and receiver 30 which is sent to a demodulator 32 and to the microprocessor 34 for GDOP (Geometric Dillusion of Precision) calculations. The microprocessor 34 also receives correct time of day signals from central timing 42. The microprocessor 34 generates pseudo random code based on exactly the same time as the satellite signal. The pseudo pseudo random code train then matches the satellite code exactly. The received train pulses from the satellites are then matched with the pseudo code train. The difference in time between the satellite time and pseudo code generated time gives the satellite ranges based on distance = velocity x time. The information is then stored in the random access memory (RAM) 36 which itself in connected to the memory controller 40.

Once the signal is processed and stored in the RAM 36, the information can be transferred through memory controller to the phone modem 44 from which it is sent to the cellular transmitter 46 for sending the information through antenna 14.

The remote unit also includes a cellular telephone receiver 48 for receiving data including a decoder 50 which connects back to the memory control and central timing to permit control from the base unit via the cellular telephone system. Referring back to Figure 2, once the signal is sent from the remote unit through the cellular phone system 16, and it is received at a CPU at the base unit, the computer 18 at the base unit will then decode the signal and, translate it into information in a suitable display 20 which will show the geographical coordinates of latitude and longitude on a map on the display.

Referring now to Figure 5, a possible configuration of the remote unit is shown which includes the helix antenna 12 for receiving the global positioning system signals and the cellular antenna 14,

all of which is mounted in a small rectangular housing 52 which could be dimensionally sized to be hand held. The remote unit could also be configured in a vehicle to use vehicle power, and as such, if used for surveillance or military use, the antennas could be hidden.

The invention as described provides for a portable hand carried or vehicle remote unit that allows individuals or objects to be located from a base station anywhere in the world using a non-complex, relatively inexpensive system that employs current cellular phone technology.

The instant invention has been shown and described herein in what it is considered to be the most practical and preferred embodiment. It is recognized, however, that departures may be made therefrom within the scope of the invention and that obvious modifications will occur to a person skilled in the art.

Claims

1. A cellular position locating system for locating the geographical coordinates using a portable hand held remote unit comprising:
   receiver means for receiving navigational signals from satellites in orbit about the earth;
   signal processing means for demodulating the satellite navigational signals;
   means for generating a pseudo random code;
   timing means connected to said demodulating means and said signal processing means;
   means for generating position information signals by comparing the time difference of the navigational signals and the pseudo random code signals;
   means for converting position information signals into cellular telephone signals;
   cellular telephone signal transmitting means;
   cellular telephone for transmitting signals via cellular telephone into the conventional phone lines;
   base unit means for processing telephone signals received from said cellular transmitter;
   said base means including means for decoding the received signal for determining geographic location position data; and
   a display means connected to said base unit for displaying the geographical coordinate information.

2. A method for locating a person or object at a remote location from a base location comprising the steps of:
   (a) receiving navigational information signals from a satellite location;
   (b) generating a pseudo random code at the remote location and comparing it to a known time signal relative to the satellite navigational signals;
   (c) providing cellular telephone modem signal processing means for transferring the navigational information into a cellular telephone signal;
   (d) transmitting the navigational signal information to a cellular telephone network;
   (e) receiving the navigational signal information through a cellular telephone to a central processing unit;
   (f) means for displaying the signal received at the base unit.

3. A cellular position locating system to provide latitude and longitude information from a remote site to a base site comprising:
   a portable housing sized to be hand held;
   portable navigational satellite signal receiving means mounted in said housing;
   timing means to provide time of day mounted in said housing;
   signal processing means having an input connected to said navigational satellite signal receiving means and said timing means to provide an output signal representing the geographical location of said satellite signal receiving means;
   telephone modem means connected to the output of said satellite signal processing means;
   cellular telephone signal transmitter connected to said modem and mounted in said housing;
   cellular telephone signal network for receiving and transmitting cellular telephone signals; and
   a base unit connected to said cellular telephone signal network for receiving cellular telephone signals and for providing a display that represents geographical positions of said navigational satellite signal receiving means.

4. A cellular position locating system as in claim 3, including:
   a cellular telephone signal receiver mounted in said housing;
   memory means mounted in said housing and connected to said cellular telephone signal receiver and said signal processing means to provide control to said signal processing means.

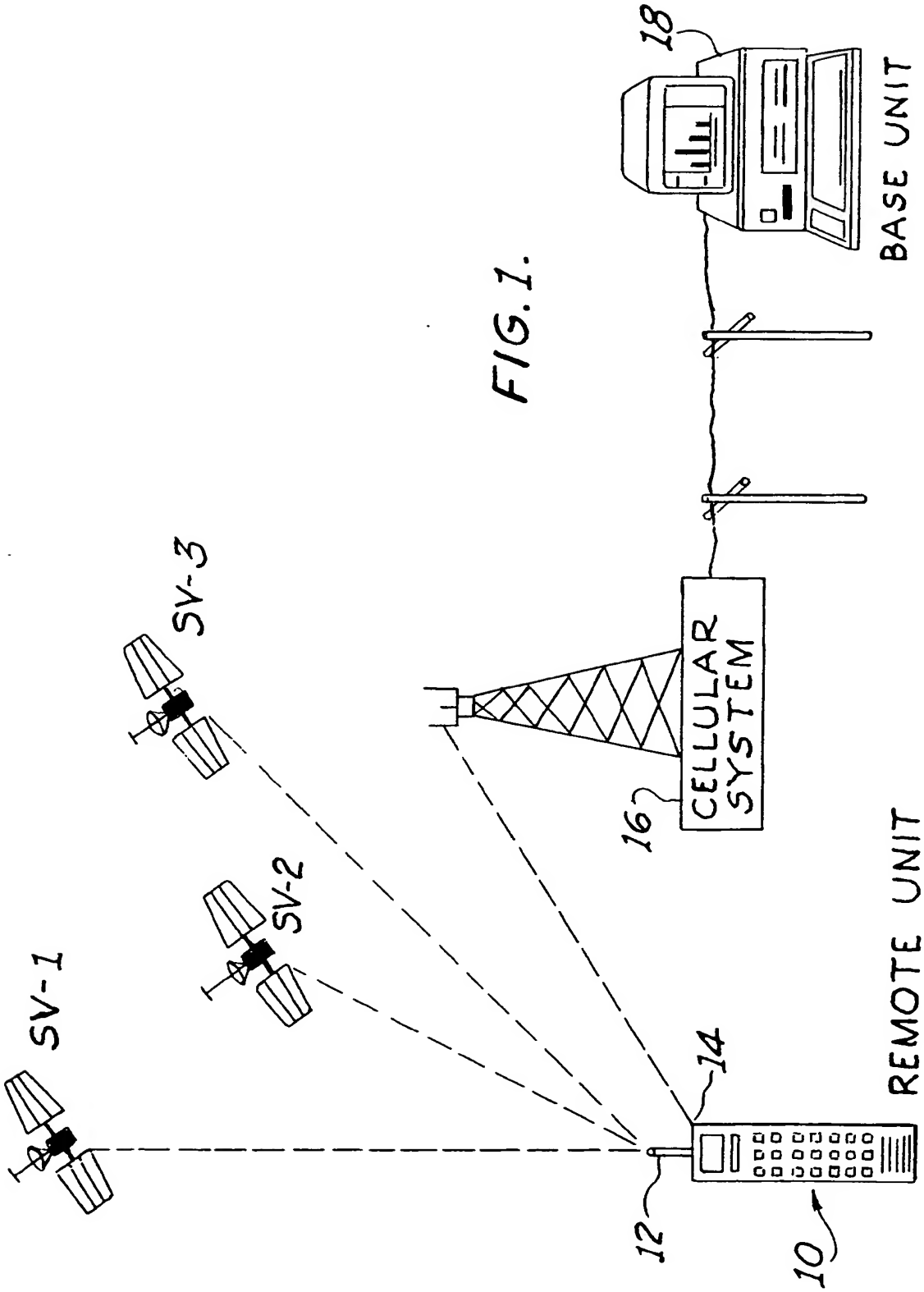

FIG. 1.

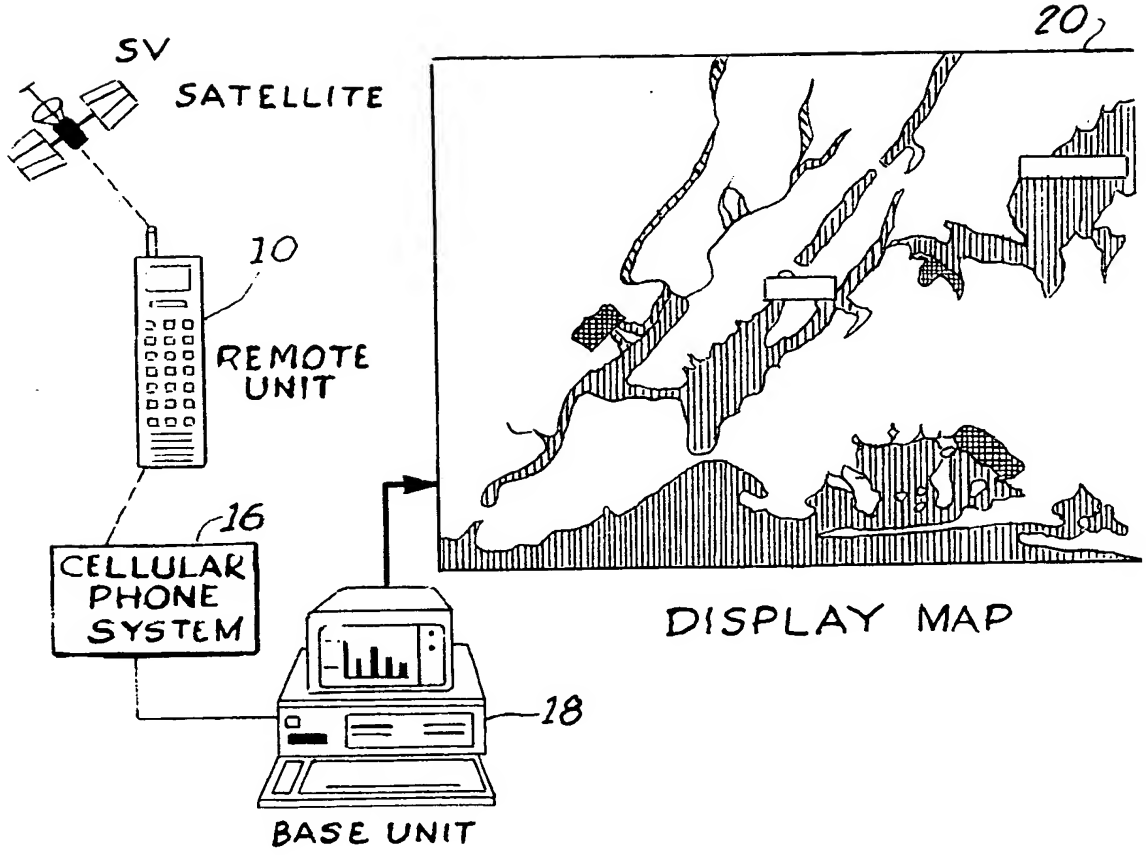

FIG. 2.

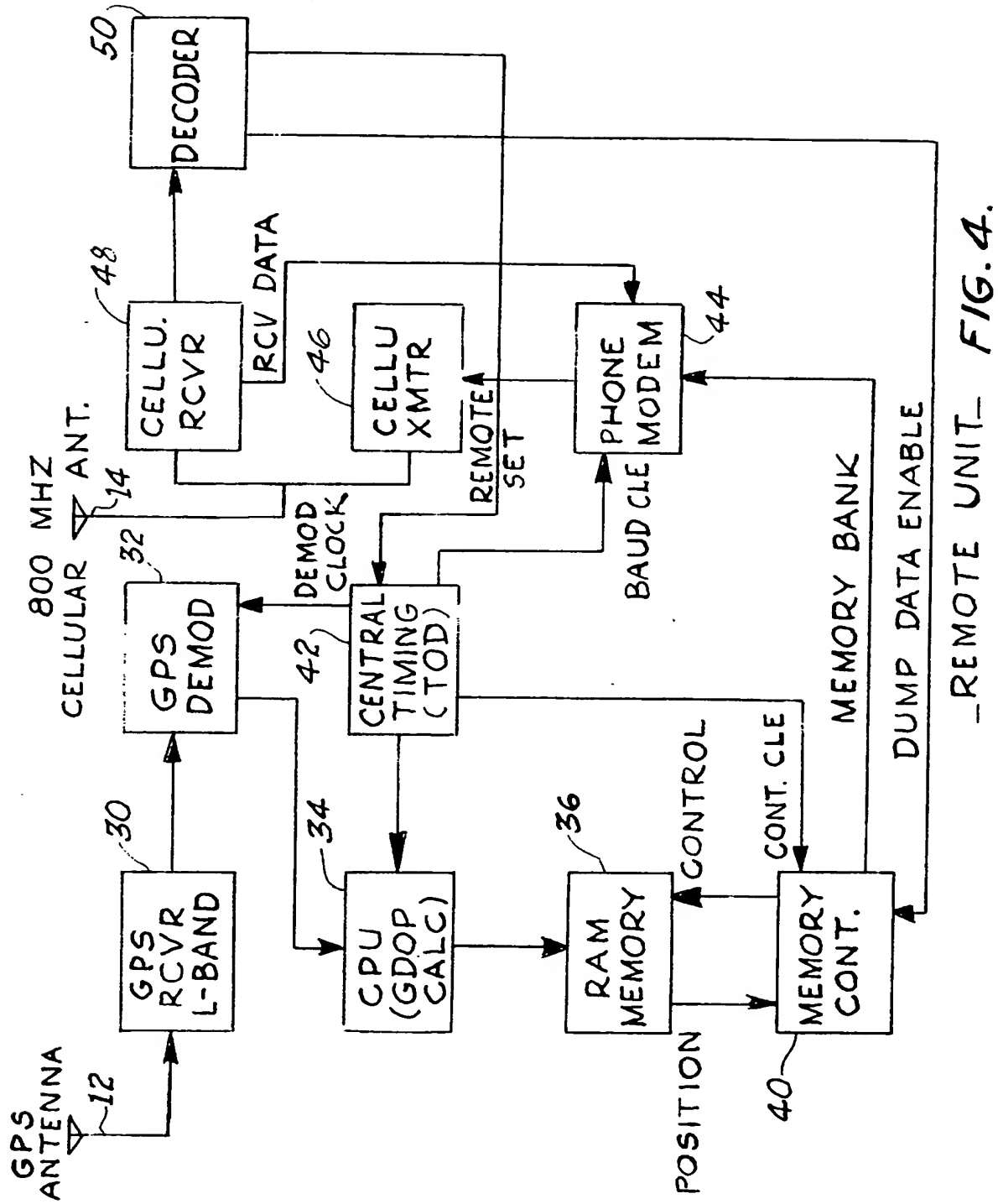

FIG. 4.

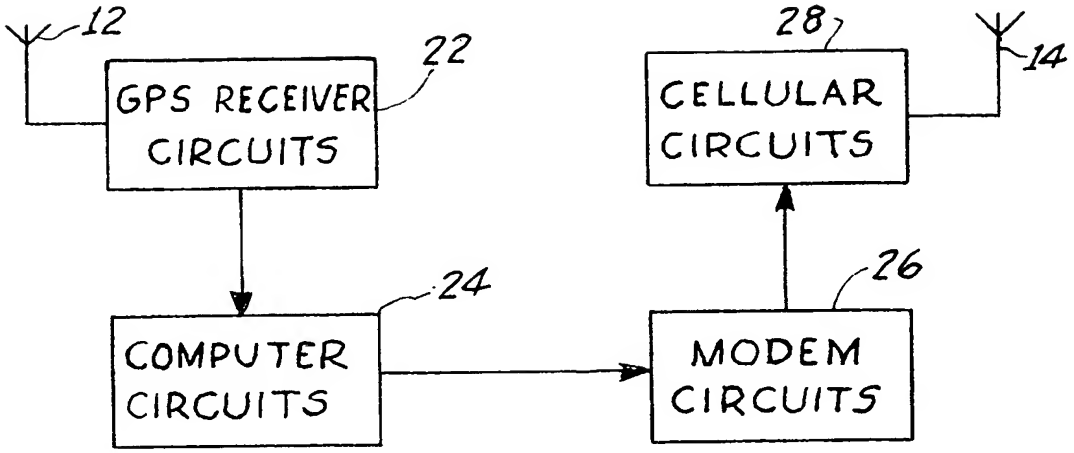

FIG. 3.

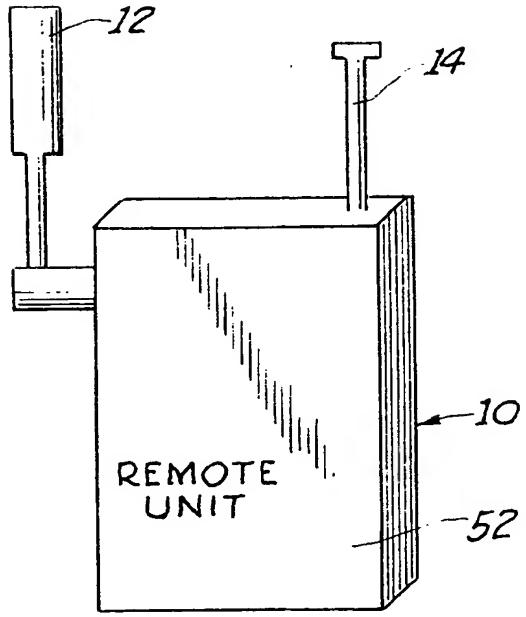

FIG. 5.

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EUROPEAN SEARCH REPORT

Application Number EP 91 30 7697

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 242 099 (ADVANCED STRATEGIES INC.) * page 2, line 4-5 * * page 2, line 42 - page 3, line 10 * * page 3, line 34 - page 5, line 50; figures 1-4 * ---	1-4	G01S5/00
A	WO-A-8 912 835 (BROWN) * page 2, line 10 - page 5, line 7 * * page 6, line 1 - page 8, line 9 * * page 8, line 36 - page 9, line 15; figures 1-3 * ---	1-4	
A	EP-A-0 379 198 (SHARP KABUSHIKI KAISHA) * the whole document * ---	1-4	
A	IEE PROCEEDINGS PART F: COMMUNICATIONS, RADAR AND SIGNAL PROCESSING, Vol.127, No.2, April 1980 Stevenage, GB. BLAIR ET AL.: "Receivers for the NAVSTAR global positioning system", pages163-167 * the whole document * ---	1-3	
E	US-A-5 043 736 (DARNELL ET AL) * the whole document * -----	1-4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

G01S
H04Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	07 APRIL 1992	HAFFNER R.D.R.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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